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(54) Abstract Title

Remote surveillance

(57) At least one camera (201, 203), which includes compression circuitry, is connected to a remote viewing station, e.g. a laptop, PC or palm organiser (205, 206), via a public communications network, such as a PSTN (202). The viewing station dials the camera's telephone number and requests compressed image frames, the camera answers by transmitting the required compressed frames to the viewing station e.g. via a modem, which are decompressed to provide viewable images. Security can be provided by a password system activated when the viewing station dials the camera. Adjustment of the camera's light sensitive parameters (e.g. sharpness, brightness) and position may be performed by signals sent from the viewing station. When not operational, the camera may enter a low power consumption (sleep) mode. Picture quality and size of the image displayed at the viewing station may be selected by the viewer (see fig. 11).

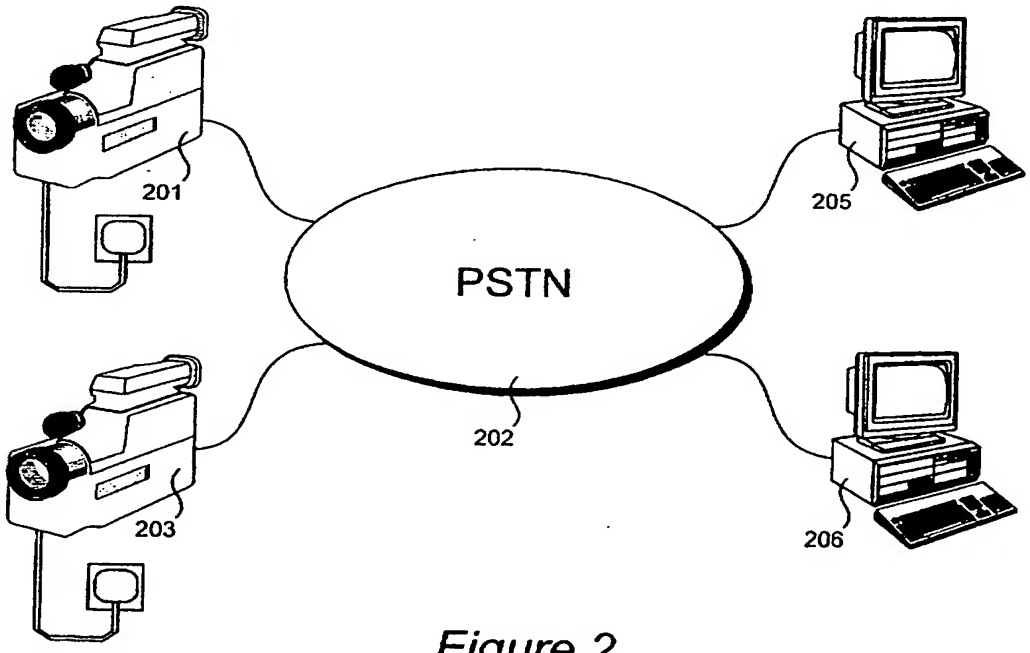

Figure 2

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

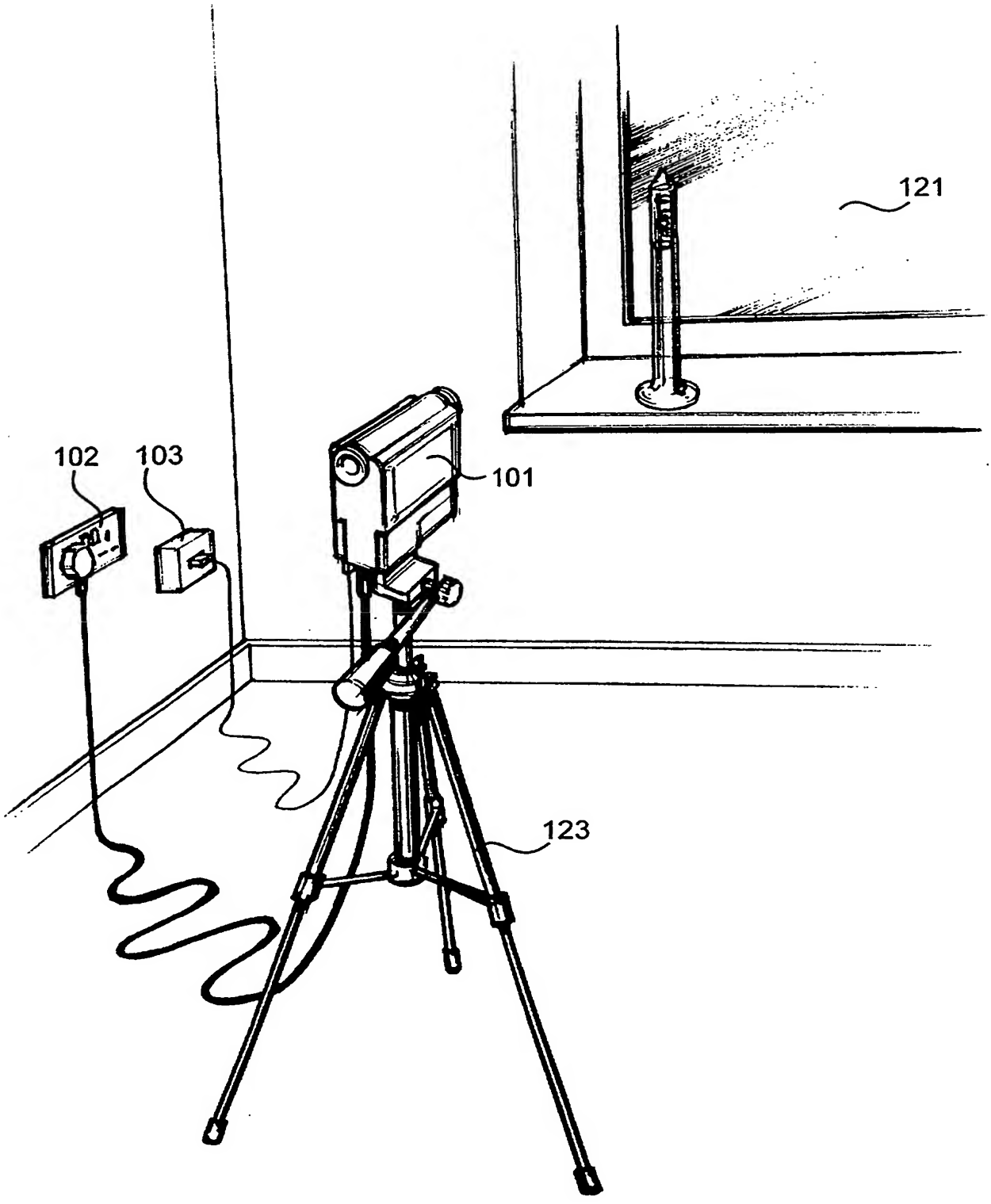

Figure 1

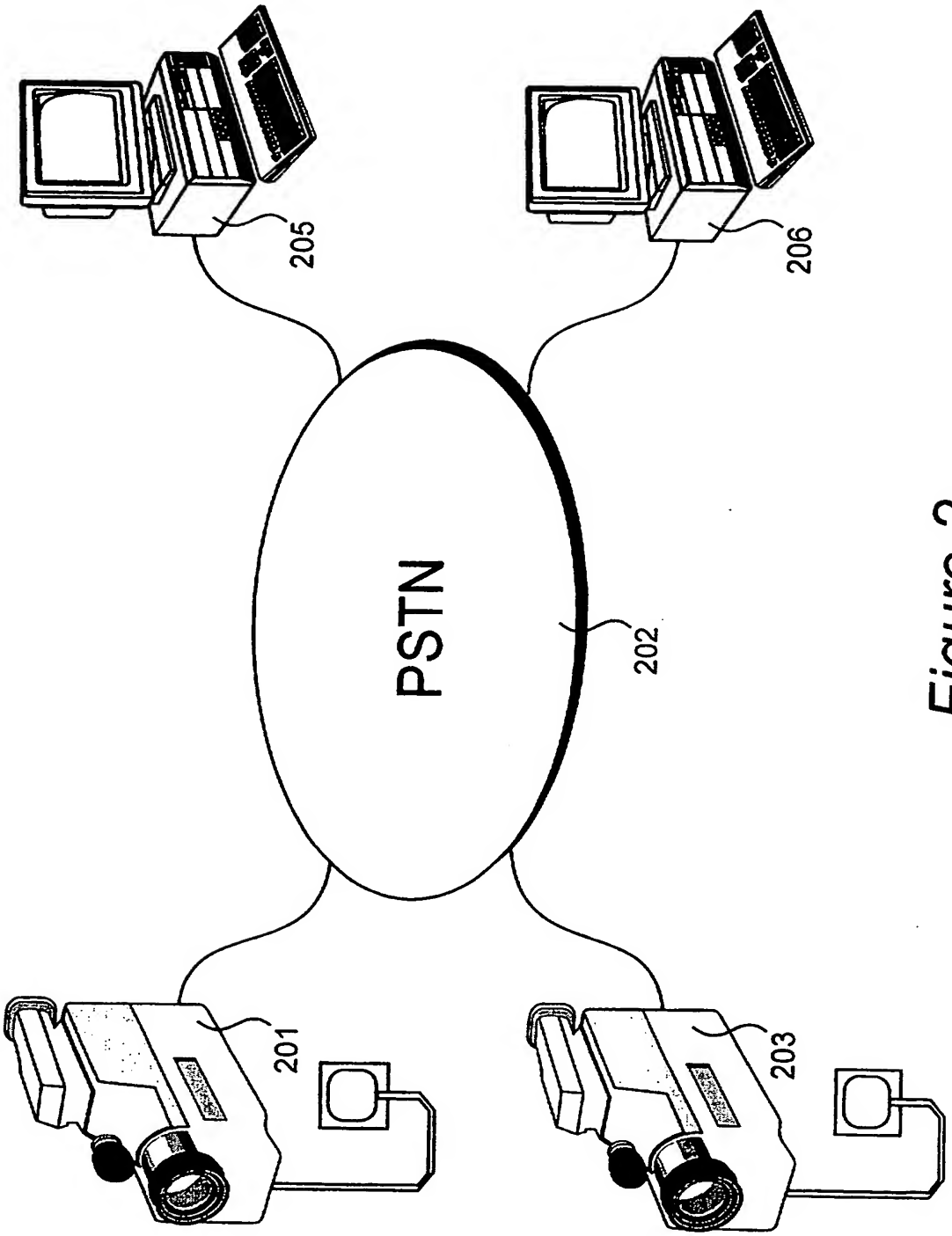

Figure 2

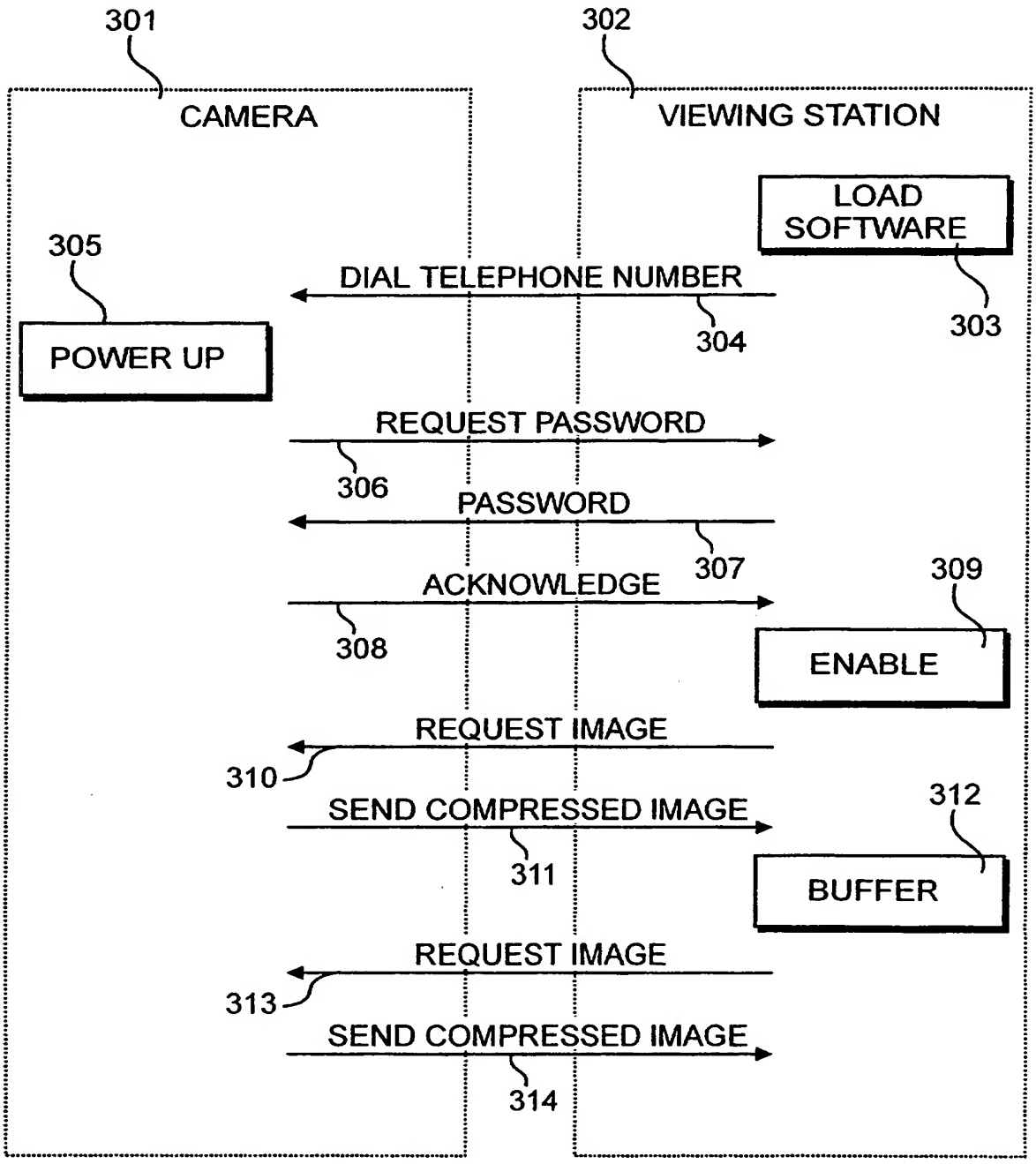
301
CAMERA
302
VIEWING STATION
LOAD SOFTWARE
303
305
DIAL TELEPHONE NUMBER
304
POWER UP
REQUEST PASSWORD
306
PASSWORD
307
ACKNOWLEDGE
309
308
ENABLE
REQUEST IMAGE
310
SEND COMPRESSED IMAGE
312
311
BUFFER
REQUEST IMAGE
313
SEND COMPRESSED IMAGE
314

Figure 3

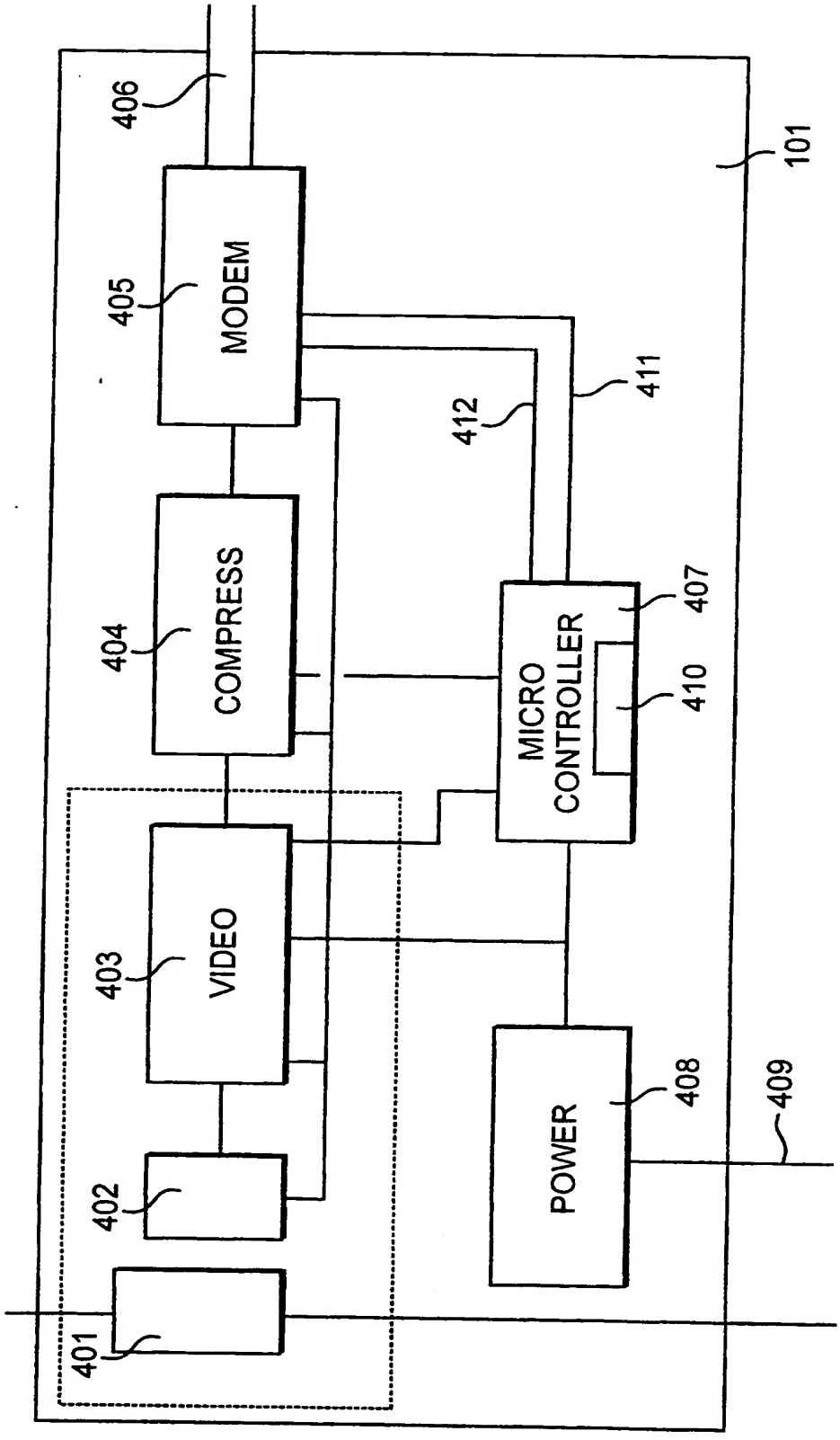

Figure 4

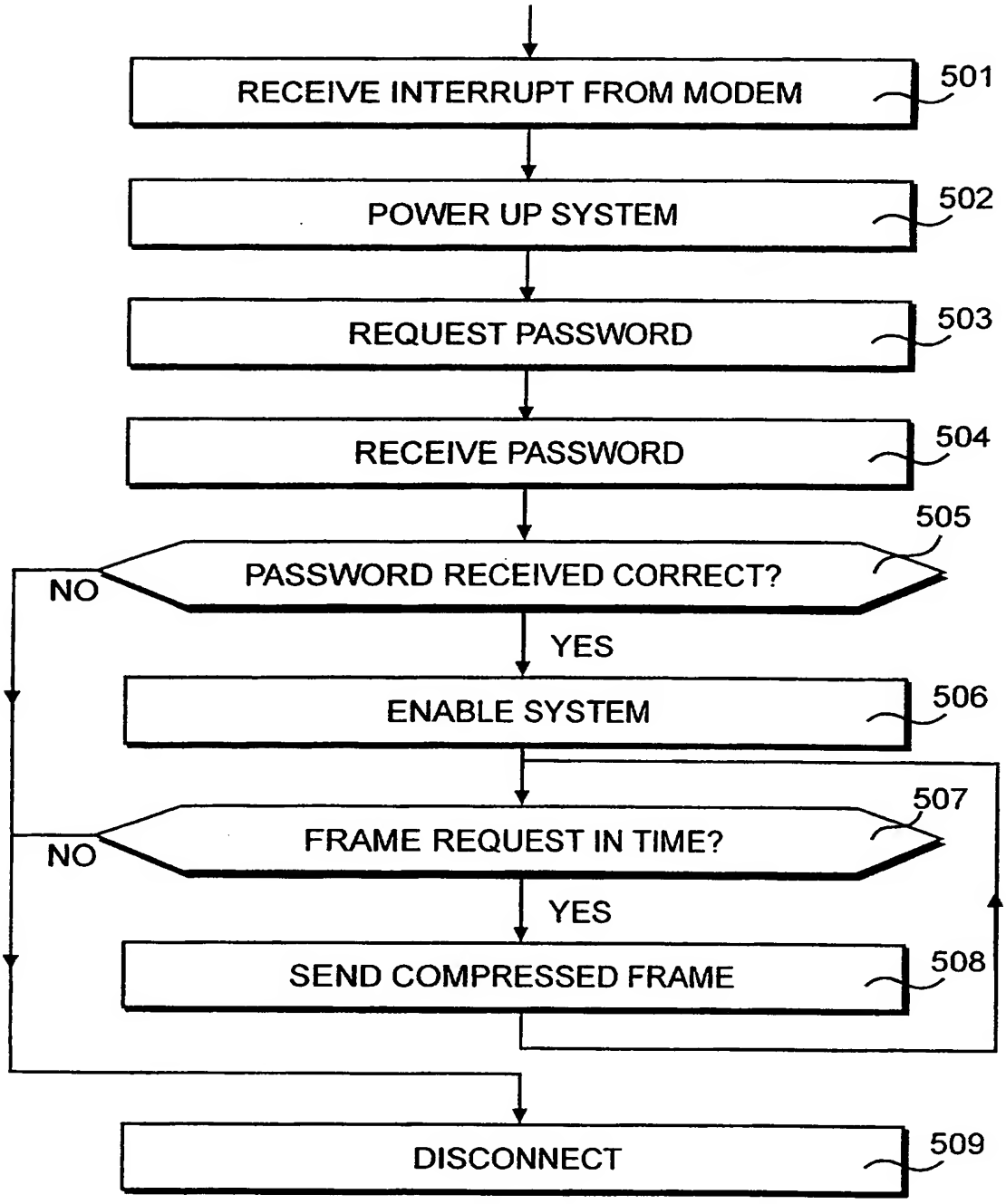
RECEIVE INTERRUPT FROM MODEM
501
POWER UP SYSTEM
502
REQUEST PASSWORD
503
RECEIVE PASSWORD
504
PASSWORD RECEIVED CORRECT?
505
NO
YES
ENABLE SYSTEM
506
FRAME REQUEST IN TIME?
507
NO
YES
SEND COMPRESSED FRAME
508
DISCONNECT
509

Figure 5

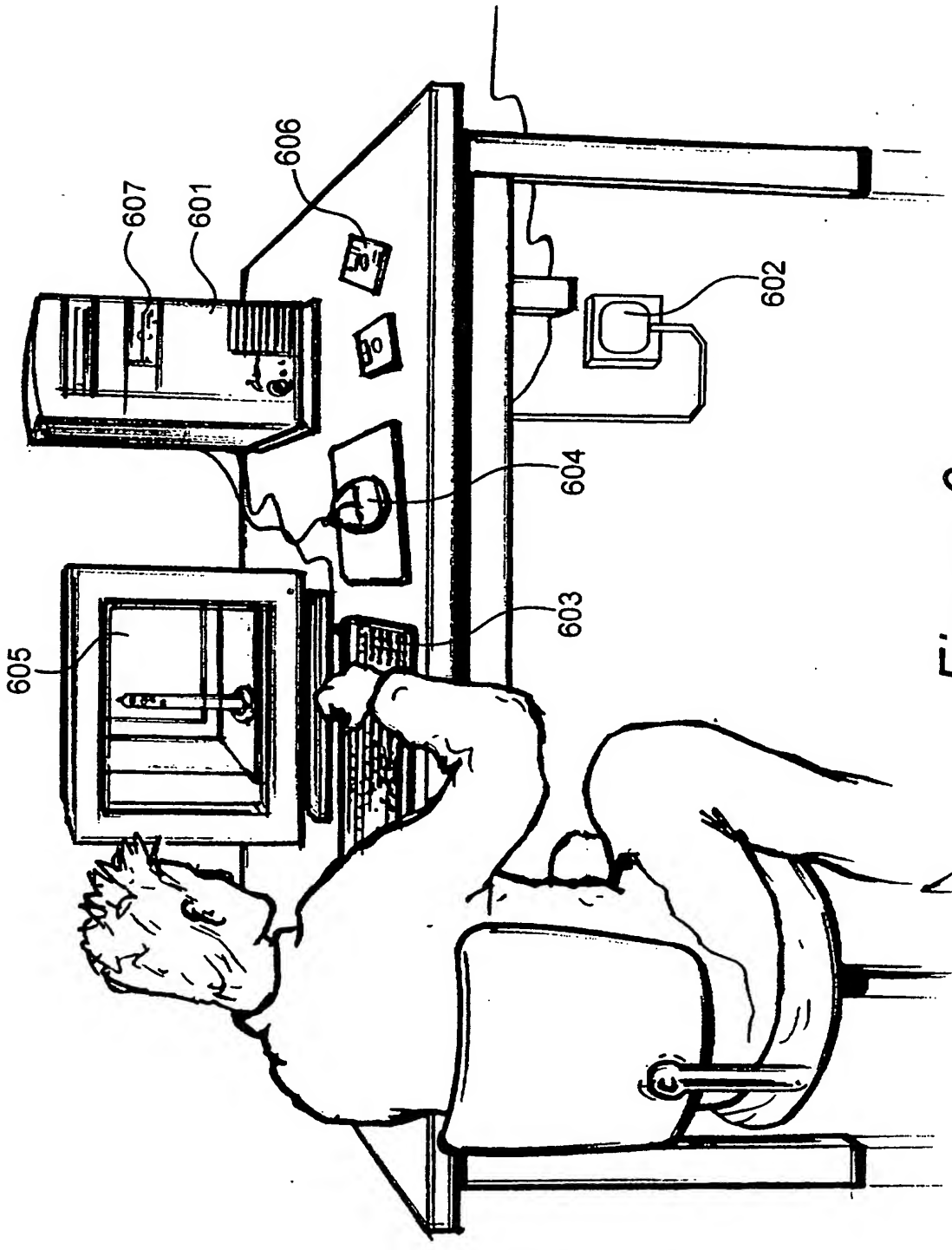

Figure 6

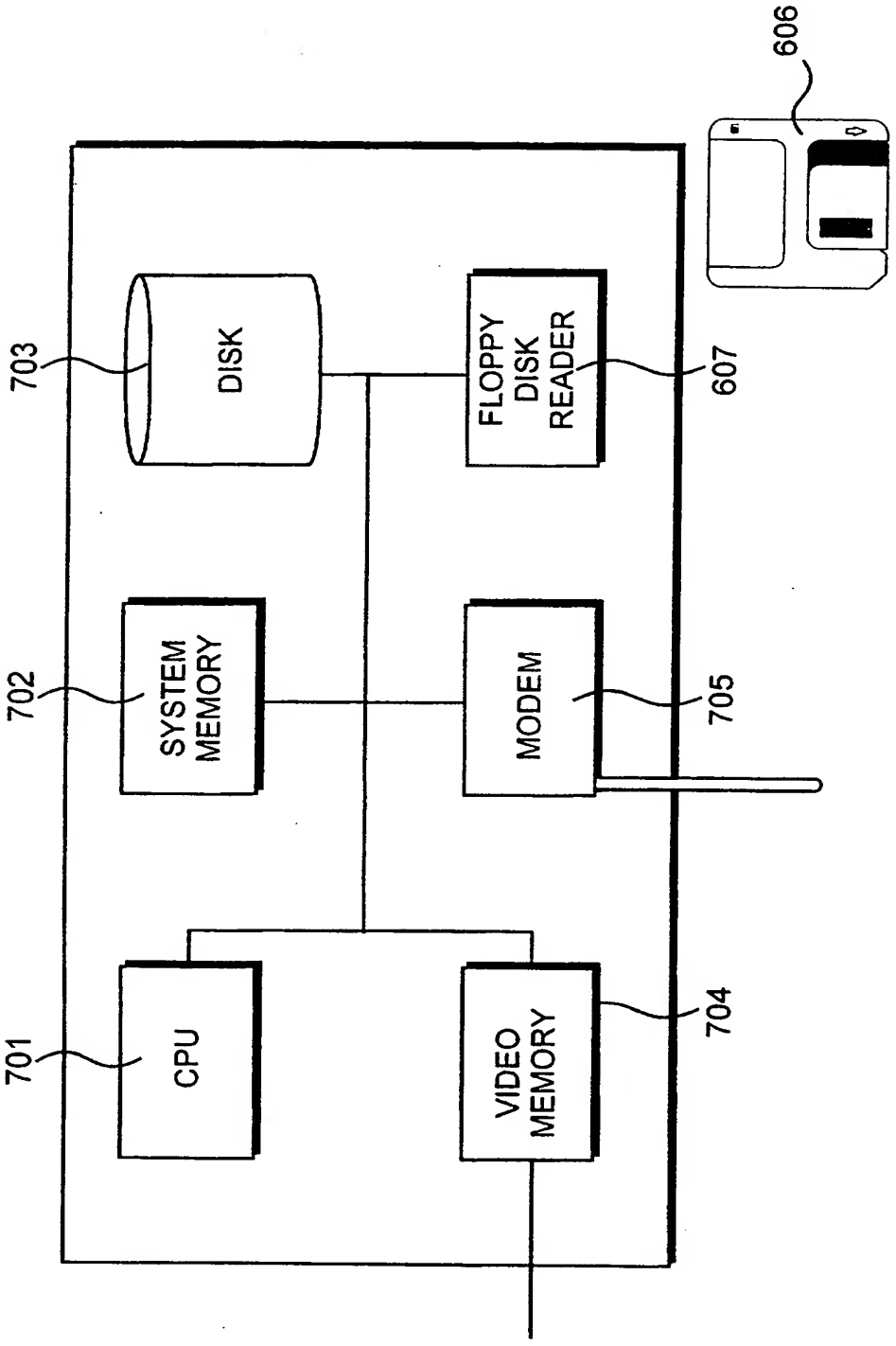

Figure 7

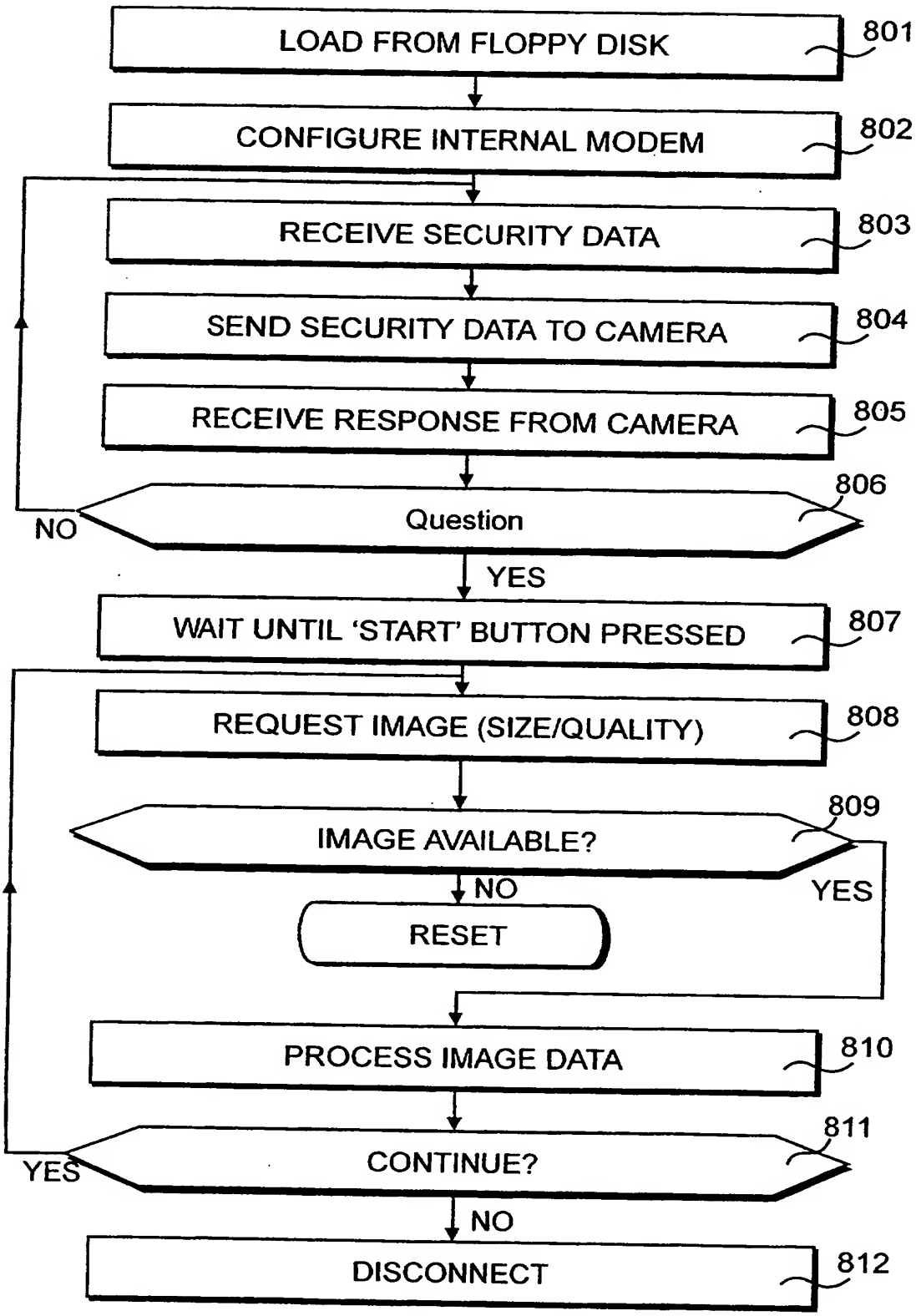
LOAD FROM FLOPPY DISK
801
CONFIGURE INTERNAL MODEM
802
RECEIVE SECURITY DATA
803
SEND SECURITY DATA TO CAMERA
804
RECEIVE RESPONSE FROM CAMERA
805
Question
806
NO
YES
WAIT UNTIL 'START' BUTTON PRESSED
807
REQUEST IMAGE (SIZE/QUALITY)
808
IMAGE AVAILABLE?
809
NO
YES
RESET
PROCESS IMAGE DATA
810
CONTINUE?
811
YES
NO
DISCONNECT
812

Figure 8

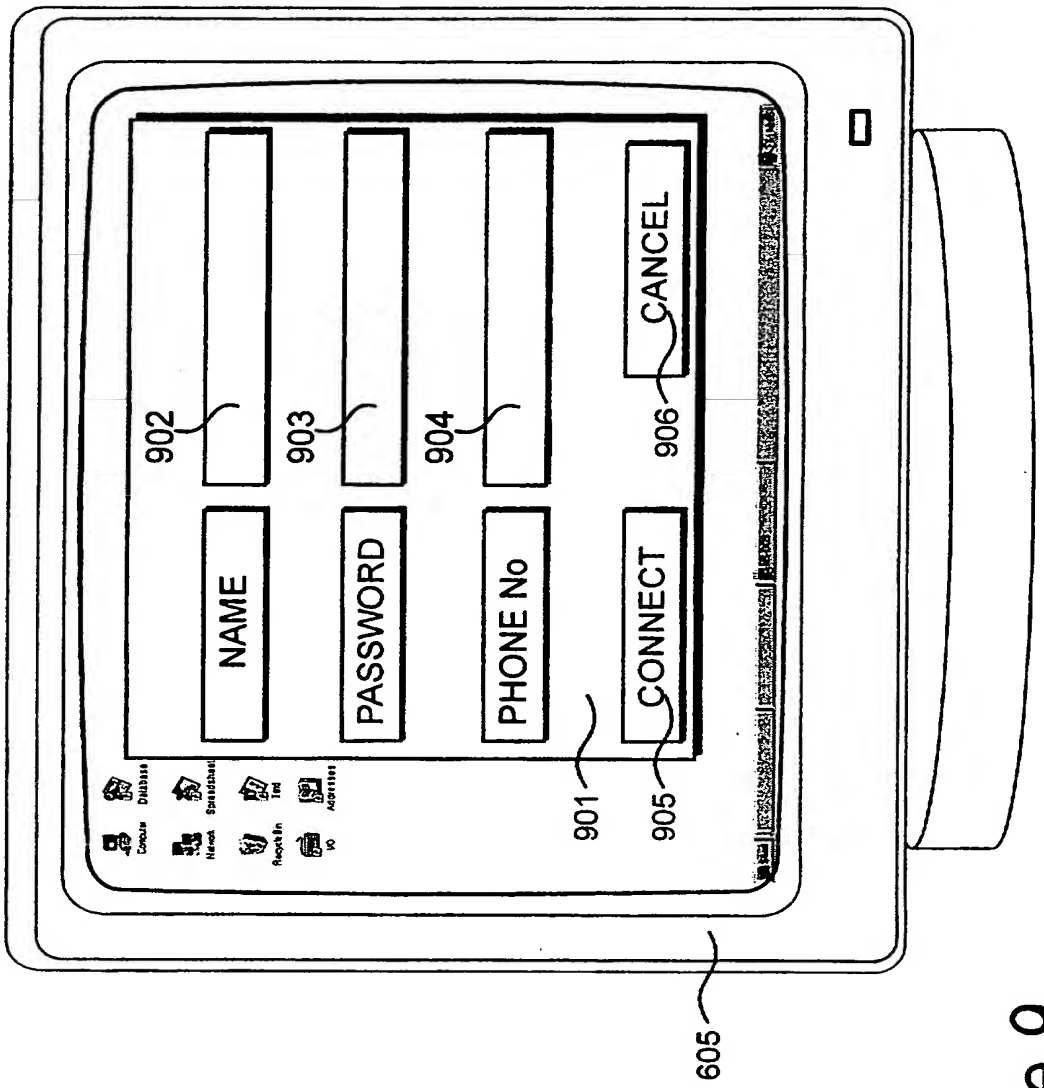
NAME
PASSWORD
PHONE No
CONNECT
CANCEL
902
903
904
906
901
905
605

Figure 9

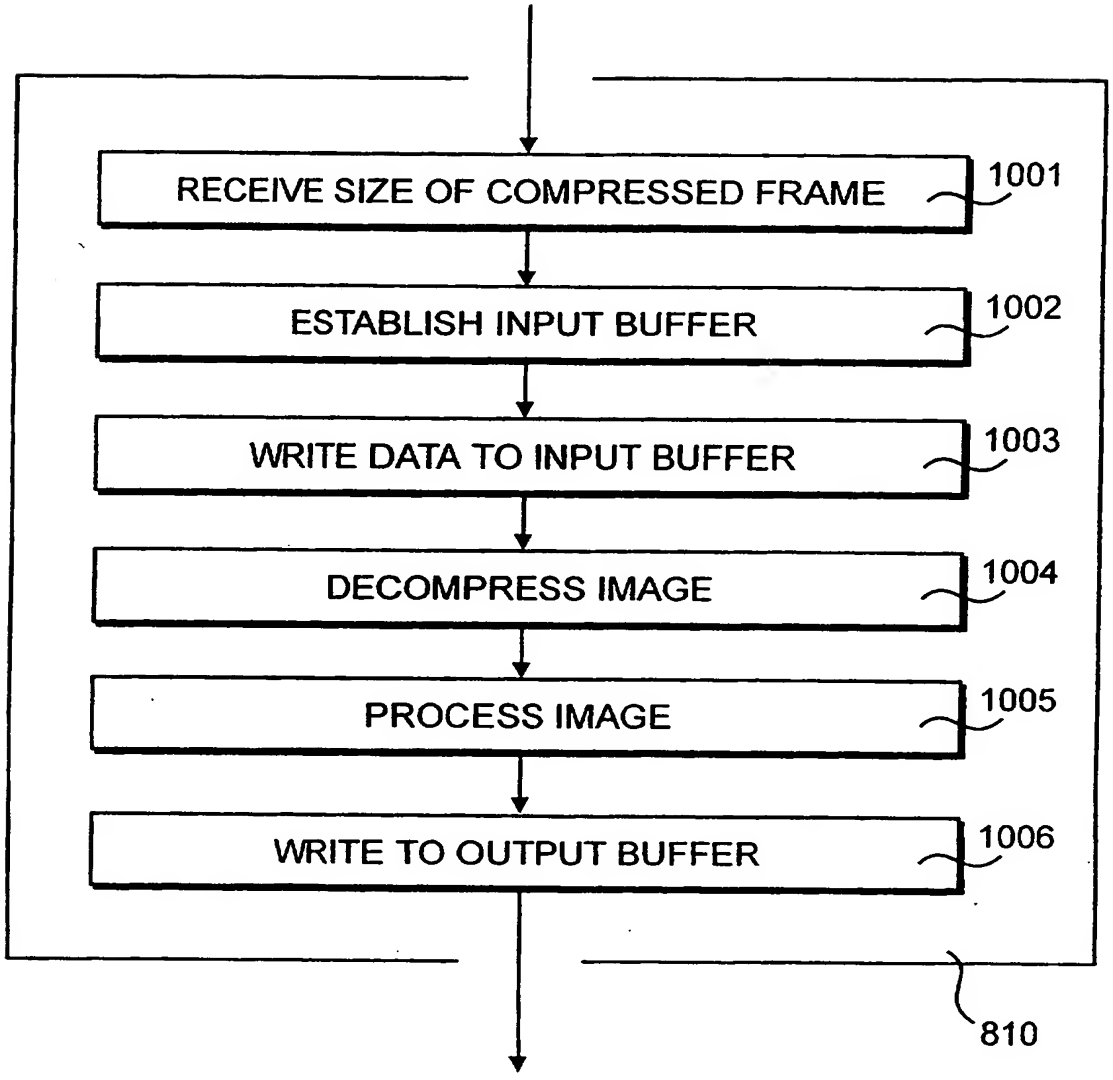

Figure 10

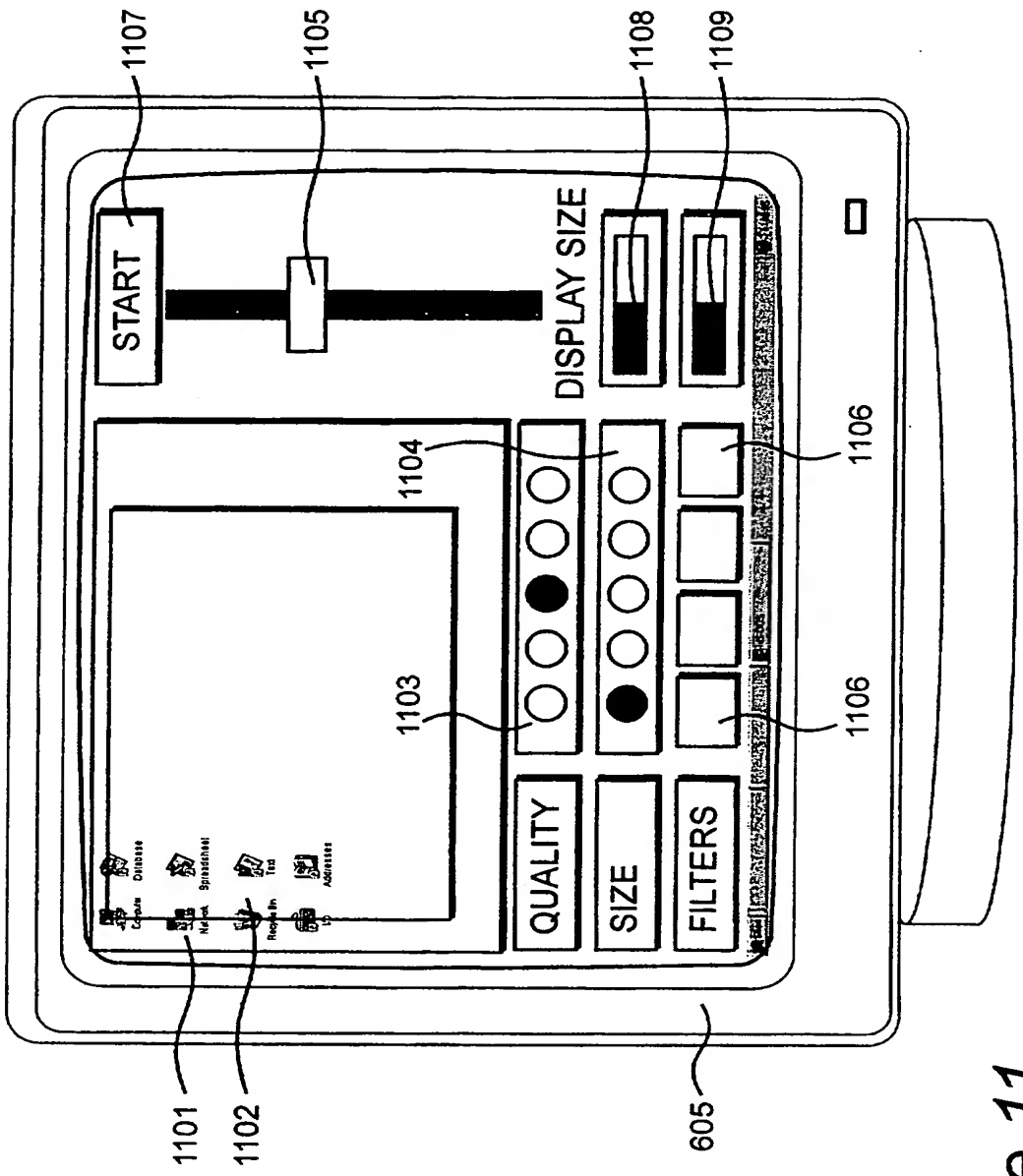
1107
1105
1108
1109
START
DISPLAY SIZE
1104
1106
1103
1106
QUALITY
SIZE
FILTERS
1101
1102
605

Figure 11

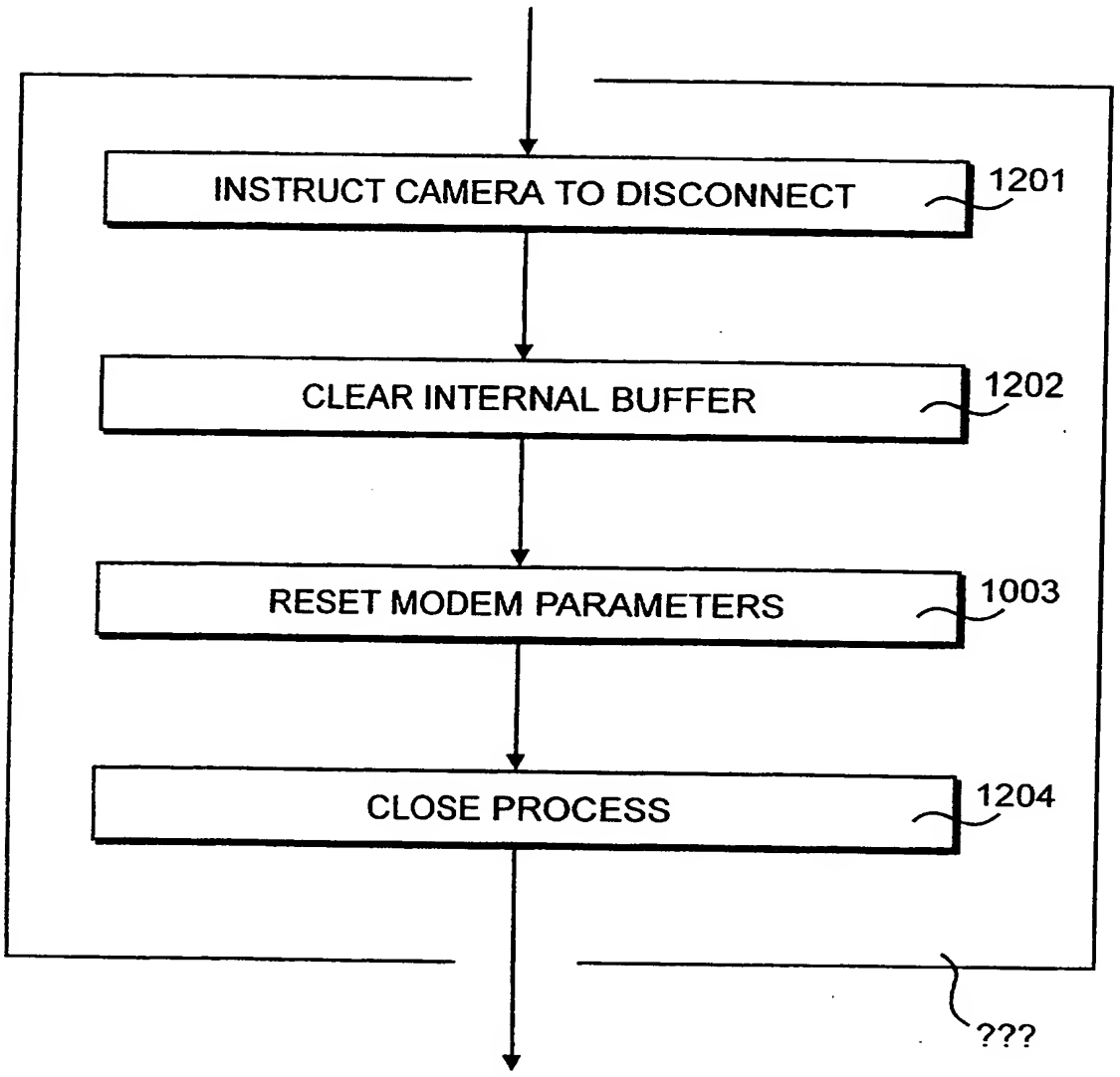
INSTRUCT CAMERA TO DISCONNECT
1201
CLEAR INTERNAL BUFFER
1202
RESET MODEM PARAMETERS
1003
CLOSE PROCESS
1204
???

Figure 12

Remote Surveillance

The present invention relates to a remote surveillance system using a video camera.

Closed circuit video surveillance systems have been used for some time in which a video camera supplies video pictures to one or more video display monitors. Such systems are appropriate to closed environments in which appropriate cables for the transmission of video images may be positioned between the camera and the display monitors, with video amplifiers included where necessary. However, such systems are only applicable to closed environments and cannot be used in an open environment in which use must be made of a public telecommunications network. In particular, a problem with such networks is that transmission bandwidth is relatively limited. Alternatively, if a high bandwidth is required the cost of transmission becomes prohibitively expensive.

In recent years, video cameras have been developed for distributing images over the world wide web. A video camera is connected to a personal computer that includes a web browser and a modem. In this way, it is possible for video images to be distributed over the Internet, often as a broadcast to many viewers. A problem with this approach is that the degree of equipment required at the transmission end becomes relatively large, in that it requires its own PC and browsing software etc. Consequently, it represents a significant overhead when used in surveillance applications. A further problem is that internet communication techniques require a significant degree of bandwidth overhead for the transmission of data and as such leave very little bandwidth available for the transmission of video images. Consequently, the images tend to be of relatively low spatial quality

and are refreshed relatively infrequently. The video image therefore takes the form of a sequence of stills separated by significant periods of time. In many surveillance applications this would not be considered acceptable in that the image quality is too poor and that something of interest may be missed between the transmission of image frames.

According to an aspect of the present invention there is provided a remote surveillance system comprising a video camera connected to a public communications network and a viewing station connected to said network, wherein said viewing station is configured to establish a call to said camera and to request compressed image frames; said video camera is configured to answer said call and to transmit compressed image frames; and said viewing station is configured to receive compressed frames from said camera and to decompress said frames to produce viewable images.

The invention will now be described by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows a remote surveillance camera;

Figure 2 shows an overview of the environment for operation of the camera shown in *Figure 1*;

Figure 3 shows operations performed by the camera of *Figure 1* within the environment of *Figure 2*;

Figure 4 details the video camera identified in *Figure 1*;

Figure 5 details operations performed by the PIC micro-controller;

Figure 6 details the viewing station identified in *Figure 2*;

Figure 7 details the main computer system shown in Figure 6;

Figure 8 details operations performed by the system shown in *Figure 7*;

Figure 9 shows a display window generated by the process shown in

Figure 8;

Figure 10 shows processes for processing image data as shown in *Figure 8*;

Figure 11 shows the display of images on the monitor shown in *Figure 6*;

Figure 12 shows procedures for disconnecting the system identified in *Figure 8*;

A remote surveillance camera **101** is shown in *Figure 1* that is connectable to a public communications network and is arranged to supply video images to a remote viewing station. The camera **101** receives power from a conventional mains outlet **102** or, alternatively, a camera may include internal batteries, preferably lithium ion batteries. In this example, the camera is connected to a conventional telephone line via a socket **103** and the camera includes an appropriate modem for communicating via this analogue channel. Alternatively, communication may be achieved over a digital connection, such as ISDN, or communication may be achieved using mobile technology, such as GSM (RSM) technology operating in data transmission mode.

The camera includes an input lens and light sensitive circuitry, such as charge couple device circuitry for producing input video images. In addition, the camera includes compression circuitry for compressing the input video images to produce compressed output images. In the preferred embodiment, the video images are compressed in accordance with the JPEG recommendations. The camera also includes a modem or similar device for supplying the compressed output data to the network. In this way, the camera is configured to receive data requests from the viewing station and to transmit output image frame data in response to these

requests.

In the example shown in *Figure 1*, the camera has been set up to view a chemical experiment, shown generally at **121**. An experimenter is waiting for a particular reaction to complete, whereafter the experimenter may return to the experiment and continue with the next stage of the process. Thus, the video camera has been set up to monitor an appropriate portion of the experiment such that the experimenter may view images from the camera via a remote viewing station. In particular, any personal computer or similar equipped with a modem and a telephone line may, temporarily, provide an appropriate viewing station, as described with respect to *Figure 6* onwards.

The camera **101** is mounted on a tripod **123** and the tripod may include motors for adjusting various positions, such as camera height, tilt and pan. In addition, motors may be included for adjusting a zoom control of the camera itself and each of these motors may be controlled remotely from the remote viewing station.

The camera **101** is connected to a conventional telephone socket **103** that in turn provides communication via the public switched telephone network. In order for a remote viewer, in this case the experimenter, to receive pictures from the camera **101**, the experimenter is merely required to dial the telephone number associated with the socket **103** whereafter, after following appropriate security provisions, images are supplied from the camera **101** to the viewing station. The brightness and sharpness of the CCD capturing unit, along with any other available parameters, may also be controlled remotely.

It should be emphasised, that the camera **101** in the preferred embodiment is not using internet technology in order to achieve this. By

dedicating the communication channel, in this case a PSTN, optimum use is made of the available bandwidth in order to obtain optimised image quality at the viewing station.

An overview of the environment in which cameras of the type shown in *Figure 1* are operated is illustrated in *Figure 2*. In this example, a first camera **201** is connected to the PSTN **202**, along with a second camera **203** that is also connected to the PSTN **202**, both by conventional telephone links.

Similar connections to the PSTN are made by a first personal computer station **205** and a second computer station **206**.

By being connected to a conventional telephone line, the first video camera **201** has a first telephone number associated with it whereas the second video camera **202** has a second telephone number associated with it. Thus, each camera may be contacted over the PSTN **202** by dialling the appropriate telephone number.

Thus, at station **205** it is possible to dial the first telephone number in order to receive images from camera **201**. In addition, it is possible to dial the second telephone number in order to obtain different images from camera **203**.

Likewise, station **206** may receive images from camera **201** or at station **206** it is possible to receive images from camera **203**.

In the preferred embodiment, executable instructions for the viewing station are retained on a portable data carrying medium such as a floppy disk. In this way, it is possible for the experimenter to retain the floppy disk and then use it in order to view images from an appropriate location. Thus, in this way, the experimenter may be working from a large office block having many computers each connected to an outside telephone line. In

accordance with the preferred embodiment, there is no need to install specific instructions at these computers. The experimenter merely loads the floppy disk into a computer and is then in a position, after satisfying security provisions, in order to receive and view images from the remote camera. In this way, surveillance has been achieved using relatively inexpensive equipment at the viewing end and the ability to view images from the camera becomes extremely easy given that they can be viewed from any machine that has an appropriate connection. In this way, the experimenter may maintain a watch on his experiment with minimal further disruption to other activities until a particular event has occurred.

The example given herein in terms of an experimenter viewing an experiment is merely one of many examples to which the camera could be used. For example, the camera could be mounted in a more secure position and used for security purposes. A camera could be permanently mounted at a particular location or could be secured temporarily while particular activities are taking place. A viewer could install several cameras, each with their respective telephone line allowing several views of a location to be received or allowing several locations to be viewed.

Operations performed within the environment shown in *Figure 2* are illustrated in *Figure 3*. The position of the camera is illustrated generally at **301** and the position of a viewing station is shown generally at **302**. Initially, at the viewing station **302**, software is loaded, as indicated by process **303**. This then results in the telephone number of camera **101** being dialled as indicated by arrow **304**. At the camera, a power-up procedures is initiated, as illustrated by process **305**, resulting in a request **306** for a password being transmitted back to the viewing station. At the viewing station a password **307** is generated and returned back to the camera. This is then

acknowledged (**308**) whereupon at the viewing station an enabling process **309** is initiated.

At this point, the camera should be in a position to transmit image frames and the viewing station should be in a position to receive and process the image frames. The process is initiated by the viewing station issuing a request for an image **310** whereupon a compressed image is then sent **311** to the viewing station. At the viewing station the compressed image is buffered **312** whereafter a further request **313** is made resulting in a further image **314** being returned. Consequently, this process of requesting an image and the compressed image being returned continues until the process is closed down.

Video camera **101** is detailed in *Figure 4*. The camera includes a lens **401** configured to focus an image upon a light sensitive device, such as a charge couple device (CCD). CCD **402** is scanned by a video circuit **403** that in turn provides a video signal to a compression circuit. Compressed image frames are supplied to a modem **405** that is in turn connectable to a socket **103** via a twisted pair connection **406**.

A micro-controller, such as a PIC processor **407** controls the operation of devices **403** to **405** and said devices, along with the micro-controller, receive power from a power supply unit **408**, connected to mains socket **102** by a mains supply lead **409**.

The micro-controller **407** includes an electrically erasable programmable memory device **410**. This stores operations performed by the micro-controller and a user name and a password that are specified by a user the first time the camera is used. Thereafter, access to the camera is only possible from a remote station if at the remote station the correct password is identified.

Operations performed by the PIC micro-controller **507** are detailed in *Figure 5*. When not operational, the camera is placed into a low power consumption mode (sleep mode) and is then powered-up upon receiving a telephone call from a remote station. Upon receiving a telephone call, detected on line **406** by modem **405**, modem **405** answers the call and supplies an interrupt to the micro-controller **407** over interrupt line **411**.

Upon receiving an interrupt the micro-controller powers-up the system at step **502**. This results in the video circuit **403** being placed in a condition allowing it to produce video images, placed as compression circuit **404** in a condition to compress said images and places modem **405** in a condition to supply image data to the telephone **406**.

At step **503** the micro-controller issues a message to modem **405** over line **412** in the form of a token that is interpreted by the instructions being executed by the remote station to the effect that the remote station is required to answer a password.

At step **504** a password is received from the remote station and at step **505** a question is asked as to whether the password is correct. In order to answer this question, the camera compares the password received at step **504** with the password stored in non-volatile memory **410**. If the password received at step **504** is considered to be correct, the video camera is enabled at step **506**. Alternatively, if the password is not correct the video camera is disconnected at step **509**, thereby freeing-up the telephone line. In alternative embodiments the video camera may ask for the password to be supplied again (possibly several times) if the password is identified as being incorrect before a disconnection occurs. Such an approach may be considered desirable because in the preferred embodiment the instructions executed by the remote station do not include

provision for passwords to be retained therefore on each connection a user must manually identify the password to the system. Consequently, there is a possibility that errors could be introduced at this stage.

In an alternative configuration a password is asked for more than once from different dialogue boxes before a connection is allowed.

If for whatever reason a malfunction occurs at the camera, at the remote station or within the telecommunications network connecting the two together, it is desirable for both parties to disconnect so that a new connection may be re-established by the making of a fresh telephone call. Consequently, procedures are included for each party to reaffirm to the other party that it is operational. Consequently, if such a reassurance is not received, the party will disconnect and await reconnection.

In the embodiment shown in *Figure 5*, the remote station periodically requests an image frame to be supplied over the communication channel. If such a request has not been made over a pre-specified period of time, the question asked at step **507** is answered in the negative and a disconnection occurs. In alternative embodiments separate procedures could be invoked in order to achieve this.

When a frame request is received, the question asked at step **507** is answered in the affirmative and a frame of compressed image data is supplied from compression circuit **404** to modem **405** whereupon the data is modulated by the modem **405** and applied to the transmission line 406.

In a preferred embodiment, devices **401** to **403** may be embodied in a single device such as an Omnivision (RTM) 7620. Preferably, the compression circuit **404** is a Zoran Zr36060. Micro-controller **407** is implemented as a PIC 16F877 and the modem may be a Multitech (RTM) MT5634SMI 56K device.

Viewing station **205** is detailed in *Figure 6*. The experimenter has

requested use of a conventional PC workstation that is normally used by someone else. A main computer system **601** includes a modem connected to a telephone line via a socket **602**. Input devices are provided in the form of a keyboard **603** and a mouse **604**. Similarly, output images are supplied to a visual display unit **605**.

In order to operate the system, the experimenter inserts a floppy disk **606** within a floppy disk drive **607**, from which executable instructions are read. The main computer system **601** is detailed in *Figure 7*. The system includes a central processing unit **701**, system memory **702**, hard disk storage **703**, video memory **704**, a modem **705** and floppy disk reader **607**. Operations performed by the system shown in *Figure 7* are detailed in *Figure 8*.

At step **801** instructions are loaded from floppy disk **606**. Alternatively, instructions may be held locally and loaded from disk storage **703**.

After loading instructions at step **801**, internal modem 705 is configured so as to operate in accordance with the preferred protocols of the transmitting modem **405**.

At step **803** security data is received from the user via manual operation of keyboard **603**. The security data received at step **803** is then sent to the camera at step **804**. A response is then received from the camera at step **805** and a question is asked at step **806** as to whether a valid connection has been achieved. If answered in the negative, control is returned to step **803** inviting the user to re-enter security data.

If a valid connection is established, resulting in the question asked at step **806** being answered in the affirmative, the system enters a wait state until a displayed start button is pressed at step **807**.

After the start button has been pressed at step **807**, the system enters an operational mode in which image frames are requested from the camera, received and processed.

At step **808** a request is made for an image to be sent of a specified size and quality. After a specified period of time a question is asked at step **809** as to whether an image is available and if answered in the negative the system is reset. The resetting ensures that the telephone line is cleared down, thereby allowing a new call to be established.

If the question asked at step **809** is answered in the affirmative, to the effect that image data is available, the image data is processed at step **801**. After processing an image a question is asked at step **811** as to whether further processing is to continue. When answered in the affirmative, control is returned to step **808** and a request for a further image frame is made. Alternatively, if the question asked at step **811** is answered in the negative, a disconnection process is performed at step **812**.

Process **803** for the receiving of security data results in a window being displayed on monitor **605**, as illustrated in *Figure 9*. Window **901** displays a form in which three fields are to be entered. These fields consist of the user's name at **902**, a password at **903** and the telephone number of the camera at **904**. Having entered details in all of these fields **902** to **904**, a user, by appropriate operation of mouse **604**, operates a connect button **905**. Alternatively, a user may operate a cancel button **906**.

Process **803** is configured such that data cannot be sent to the camera at step **804** until all of the fields have been completed. Thus, in addition to the telephone number being called, a user must enter the correct user name and the correct password. User name details are stored by the executable procedures illustrated in *Figure 8* and the password is

stored by the camera at **410**. Thus, having entered data in all three fields and operated the connect button, details of the password are sent to the camera at step **804**.

Processors **810** for the processing of image data are detailed in *Figure 10*. At step **1001** the viewing station receives an indication of the size of the compressed frame to be transmitted by the camera. Each input frame supplied to compression circuit **404** has a specified size and therefore a predetermined data volume. The JPEG compression routine compresses the image data by procedures that take account of the redundancy within the data itself. Consequently, the size of an output frame will depend on several factors, including the complexity of the original input frame. Thus, if images are moving for example, the complexity of the images will change on a frame by frame basis. It is also possible to change the size of the input images that will in turn change the size of the resulting output data and to change the quality of the images. Quality is inversely related to the degree of data that is discarded during the compression process. Thus, with lower quality, the compression procedure becomes more lossy.

Having been informed as to the size of an incoming frame at step **1001**, an input buffer for the frame is established at step **1002**. Thereafter, as the data is received, the data is written to the input buffer at step **1003**.

After receiving a complete frame, the image frame is decompressed at step **1004** to reconstitute an image frame having a number of pixels that equals the number of pixels present in the original input image. However, due to the JPEG compression procedure, there will have been a degree of loss and degradation.

At step **1005**, further processing of the image is performed, as

required whereafter at step **1006** the image is written to an output buffer, that could be included as part of the video memory **704**. Thus, the image held in the output buffer is then read at the output display frame rate so as to maintain a steady image on a display monitor such as monitor **605**, which is then refreshed periodically when new image data is received.

The transmission channel through the PSTN **202** does convey instructions and elements of data used to control the operation of the systems. However, the amount of data used for these purposes is extremely small compared to the transmission of video data. In this way, the system is optimised for video data transmission so as to make optimum use of the available transmission bandwidth. In this way, the quality of images supplied through the telephone system is considerably higher than that available through conventional web camera techniques. However, it should be appreciated that the transmission of data through the PSTN does present the major real time constraint and other processes performed by this system, such as the decompression algorithm, take up relatively little time compared to the time required for a frame of compressed data to be transmitted.

During the processing of image data, input video images received from camera **101** are displayed on monitor **605**, as detailed in *Figure 11*. The received video image itself is displayed within a window **1101** and, typically, does not fill the whole of this window. Thus, in the example shown in *Figure 11*, the actual image occupies region **1102** within window **1101**.

Monitor **605** also displays various controls, that are operated in response to movement of mouse **604**.

A region **1103** allows a capture quality be defined, that effectively defines the degree of compression. The first button defines a quality of fifty

percent, a second defines a quality of thirty percent (a default value) and a third defines a quality of ten percent. Thus, the first button allows a high quality to be selected in which only fifty percent of the data is discarded. A second button allows a medium quality to be selected with seventy percent of the data being discarded and a third button allows a low quality to be selected with ninety percent of the data being discarded. Lowering quality increases the level of loss but reduces the amount of data which needs to be transmitted therefore over a period of time it is possible to transmit more frames. Thus, a high quality is selected if a low frame rate is tolerable but high definition is required. Similarly, low quality is selected if a higher frame rate is required at lower definition.

A region **1104** allows an input image size to be selected. This represents the number of pixels processed by video circuit **403**. A first button allows the large image size to be selected of three hundred and twenty by two hundred and forty pixels. A second button (the default) allows a medium size to be selected of one hundred and sixty by one hundred and twenty pixels. A third button allows a small image to be selected of eighty pixels by sixty pixels. A large image allows more detail to be seen within the picture but a small image will allow a higher frame rate to be achieved. Thus, like quality, there is a trade-off between image size and frame rate.

A soft slider **1105** allows an output display size to be selected. Increasing the output display size effectively magnifies and increases the size of region **1102**, without actually increasing its data content. Thus, the degree of magnification performed by this process usually depends on a viewer's preference, although it may be adjusted to suit particular scenes or situations.

In an enhanced embodiment, seven image sizes are provided for

ranging from 40w by 30h to 320w by 240h. Similarly ten levels of compression are provided for ranging from fifty percent to ninety five percent. This gives a user enhanced control over image quality and frame rate.

Soft buttons **1106** allow various types of filters to be selected. A first filter significantly increases contrast and therefore emphasises boundaries and in the extreme effectively performs an edge detection process. Such a procedure may be particularly attractive if image quality is low and a user is particularly interested in sudden movement.

The other buttons may be used to invoke various other filters, such as softening filters, sharpening filters, enhancement filters, embossing filters, a defocus filter and a blurring filter. The value of these filters will depend significantly on the type of image being viewed. In an enhanced embodiment it is possible to combine two filters, such as smoothness and edge detection, or smoothness and negation.

As shown in *Figure 8*, the loading of image frames does not start until a start button is pressed at step **807** and this start button is illustrated in *Figure 11* at **1107**.

A first display **1108** indicates the rate at which data is being received in terms of bytes per minute. A second display **1109** indicates the number of frames that have been received over a specified period. Thus, indicators **1108** and **1109** provide reassurance to a user to the effect that data is actually being received and updated, even if no changes are occurring in the image being viewed.

Procedures **812** for disconnecting the system are detailed in *Figure 12*. At step **1201** the system issues a command to the camera to the effect that a disconnection is to occur. Upon receiving this disconnection notice,

the camera purges its compression circuit **404** of any data that may be held temporarily and then enters its sleeping state.

At step **1202** internal buffers at the viewing station are cleared such that no data received from the camera remains resident within the computer after a session has been completed. Such an approach provides a significant advantage over internet solutions in that there is no risk of buffered images remaining resident on the computer system.

At step **1203** modem and any other modified parameters are reset, thereby placing the computer system in a condition equivalent to that before floppy disk **606** was read.

The process is then closed down at step **1204** and if not already done so, the floppy disk **606** would be removed from the floppy disk drive.

In a first preferred embodiment, the minimal nature of the computer system is perceived as an advantage in that it may be produced at significantly lower cost compared to alternative solutions. In this way, it is possible to install surveillance apparatus in situations where existing technology would not prove commercially viable. Thus, for example a house could be monitored while residents are on holiday so as to provide them with reassurance to the effect that everything is well back at home. In the example given herein, an experimenter is allowed to monitor the progress of an experiment from remote locations thereby relieving the experimenter of the need to periodically check equipment etc. The solution is therefore seen as providing a platform to extent applications for surveillance equipment of this type.

In enhanced systems, the camera could include an infrared light allowing the camera to view images without the presence of visible light. An alternative enhanced version may include a movement detector, similar to

infrared detectors used for intruder alarms. Thus, in response to detecting movement, the camera could attempt to contact a user who would then be invited to view images being produced by the camera. Alternatively, a message could be sent to an automated computer system configured to record images when motion is detected.

In an enhanced system, the viewing station could be modified so as to make provision for images to be recorded in temporary files. An indication can be provided to show a user how much local storage is available for this purpose. It is also possible to vary the amount of storage allocated for this purpose.

In the example shown herein, the viewing station takes the form of a conventional personal computer. However, in alternative embodiments other platforms could be used such as computers or hand held devices etc. A plurality of cameras could be co-ordinated in a local radio environment employing appropriate multiplexing protocols, such as those defined by the blue tooth (RTM) recommendations.

In an enhanced embodiment, the camera may send a message by a pre-specified means to a pre-specified destination upon a pre-specified action taking place. The action could be as a result of movement being detected, possibly using infra red technology. Alternatively, a power low condition could be identified or a detection to the effect that access had been attempted using an incorrect password. Messages could be sent by SMS, fax, or pager etc. After a message has been sent, the processor is placed into sleep mode to prevent messages being continually sent.

The camera does not include any components that make an audible noise, therefore an intruder would not be made aware of a call being made to the camera in order to capture images.

Claims

1. A remote surveillance system comprising a video camera connected to a public communications network and a viewing station connected to said network, wherein

said viewing station is configured to establish a call to said camera and to request compressed image frames;

said video camera is configured to answer said call and to transmit compressed image frames; and

said viewing station is configured to receive compressed frames from said camera and to decompress said frames to produce viewable images.

2. A remote surveillance system according to claim 1, wherein said viewing station is configured to receive a telephone number of the video camera and a password before establishing a call to said camera.

3. A remote surveillance system according to claim 1, wherein said viewing station is configured to request compressed image frames of a specified size and/or a specified quality.

4. A remote surveillance system according to claim 1, wherein said viewing station is configured to display information relating to the amount of data received and/or the number of frames received from the video camera.

5. A remote surveillance system according to claim 1, wherein said viewing station includes recording means configured to record images

to a temporary file.

6. A remote surveillance system according to claim **1**, wherein said viewing station takes the form of a desktop personal computer, a lap top computer or a palm organiser.

7. A remote surveillance camera connectable to a public communications network for supplying video images to a remote viewing station, comprising

input means for producing input video images;

compression means for compressing said input video images to produce compressed output image data;

communication means for receiving input signals from said network and for supplying said compressed output data to said network, wherein said communication means is configured to receive data requests and to transmit said output data in response to said requests.

8. A camera according to claim **7**, including storage means configured to store an authentication code.

9. A camera according to claim **8**, including means for recording said authentication code during a first operational use.

10. A camera according to claim **8**, configured to enter a waiting or sleeping state until a telephone call is received from a remote viewing station.

11. A camera according to claim **7**, including control means for

controlling attributes of said camera in response to signals received from a viewing station.

12. A camera according to claim **7**, including infrared detection means for detecting the presence of infrared emitters.

13. A camera according to claim **12**, including means for generating an alert signal in response to an output being received from said infrared detection means.

14. A camera according to claim **7**, including means for emitting infrared light.

15. A camera according to claim **7**, wherein said public communications network is a public switched telephone network (PSTN) the integrated services digital network (ISDN) or a mobile telephone network.

16. A computer-readable medium having computer-readable instructions executable by a computer such that, when executing said instructions, a computer will perform the steps of

establishing a call over a public network to a remote video camera, wherein said camera is configured to answer said call and to transmit compressed image frames; and to

receive compressed frames from said video camera and to decompress said frames to produce viewable images.

17. A computer-readable medium having computer-readable

instructions according to claim **16**, such that when executing said instructions a computer will also perform the step of receiving a telephone number of the video camera and a password from the user before establishing a call to the camera.

18. A computer-readable medium having computer-readable instructions according to claim **16**, such that when executing said instructions a computer will also perform the step of requesting compressed image frames of a specified size and/or a specified quality.

19. A computer-readable medium having computer-readable instructions according to claim **19**, such that when executing said instructions a computer will also perform the step of displaying information relating to the amount of data received and/or the number of frames received from the video camera.

20. A computer-readable medium having computer-readable instructions according to claim **16**, such that when executing said instructions a computer will issue commands for controlling attributes of the camera.

21. A remote surveillance system comprising a video camera connected to a public communications network and a viewing station substantially as herein described with reference to the accompanying drawings.

22. A remote surveillance camera connectable to a public communications network for supplying video images to a remote viewing

station substantially as herein described with reference to the accompanying drawings.

Application No: GB 0103365.3 **Examiner:** Iwan Thomas
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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): H4F FAAE, FDX, FCK; H4K KOD3

Int Cl (Ed.7): H04N 7/18

Other: Online: WPI, EPODOC, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2350520 A	(CELESTICA) See especially fig. 1	1, 3, 6, 7, 15, 16
X	GB 2318018 A	(HONG KONG TELECOMMS) See whole document	1, 3, 6, 7, 16 & 18 at least
X	GB 2307818 A	(GPT) See whole document	1, 3, 7, 16
X	GB 2253121 A	(NORTHERN) See abstract, fig. 1 and 1st full para. on page 4	1, 7, 15, 16
X	GB 2205465 A	(RICOH) See abstract and pages 6-9	1,7,15&16
X	WO 96/24284 A1	(INDIANA) See especially pages 3-9	1,5-7,11, 15,16,20

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